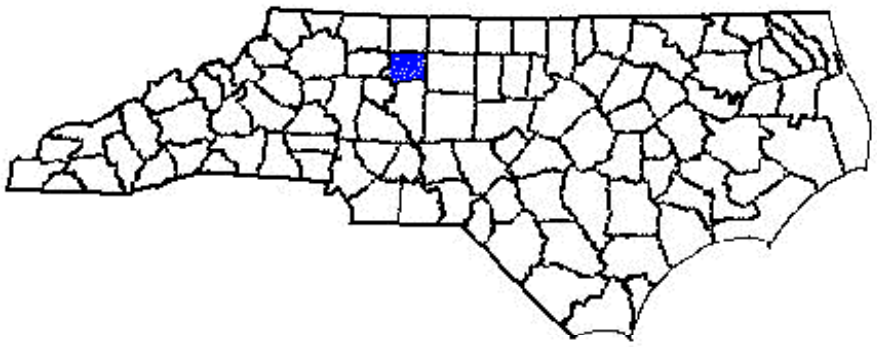
ANNUAL REPORT FOR 2003



Friedburg Marsh Mitigation Site
Forsyth County
Project N0. 6.628001T
TIP No. R-2247

Prepared By:
Office of Natural Environment & Roadside Environmental Unit
North Carolina Department of Transportation
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SUMMARY

The following report summarizes the monitoring activities that have occurred in 2003 at the Friedburg Marsh Mitigation Site. Friedburg Marsh was constructed in the winter of 1999 and spring of 2000. Monitoring activities in 2003 represent the third year of monitoring following construction. The site must demonstrate hydrologic success during the five-year monitoring period or until the site is deemed successful.

Friedburg Marsh is composed of existing wetlands, upland buffer areas, wetland restoration areas, and wetland creation areas. A total of twelve groundwater-monitoring gauges were installed on the site. There was no planting of trees or herbaceous species at Friedburg, so vegetation monitoring is not required. Qualitative visual observations in conjunction with the hydrologic monitoring of the existing vegetation were made.

The daily rainfall depicted on the well data graphs was obtained from the NC State Climate Office, Winston-Salem weather station. The historical rainfall data used in the 30-70 graph was also obtained from the NC State Climate Office, Yadkinville weather station.

The vegetation in the restoration areas was dominated by wetland plant species and includes a variety of other species. Also, a number of attempts were made this year to meet onsite with Mr. Dennis Herman of the Museum of Natural History. Due to scheduling conflicts, the meeting has not taken place. NCDOT's intention was to discuss the mowing of the site, with respect to potential impacts to the bog turtle habitat. NCDOT will schedule an onsite meeting with Mr. Herman in 2004.

In March 2003, NCDOT convened onsite to inspect a reported pond leak. The visit occurred the day after a significant rain event. The riser structure was inspected and it was determined that the structure is functioning properly with no observed leaks. Further, a pipe was discovered at the upper end of the pond (it had not been removed during construction). It was noted that the pipe only drained water when the pond was near capacity; therefore it does not adversely affect the pond nor the site.

For the 2003 monitoring year, the data indicates that all (12) of the groundwater gauges met the hydrologic success criteria of saturation within twelve inches of the surface for more than 5% of the growing season. Five of the gauges reported saturation/inundation for the entire growing season. Gauge (S4940FC) could not be located during the 2003-growing season; therefore no hydrologic data is available. NCDOT will locate this gauge before the beginning of the 2004-growing season or will be replace it if missing.

NCDOT will continue hydrologic and vegetation monitoring at the Friedburg Marsh Mitigation Site.

1.0 INTRODUCTION

1.1 Project Description

The Friedburg Marsh Mitigation Site, located in southern Forsyth County (Figure 1), is the easternmost known location (in North Carolina) for the bog turtle (*Clemmys muhlenbergii*). The southern population of bog turtle is federally listed as a Threatened Species due to Similarity of Appearance. Due to the diverse wetland communities at this marsh, the Piedmont Land Conservancy and the North Carolina Natural Heritage Program consider the site a regionally significant natural site. The Friedburg Marsh Mitigation Plan calls for the preservation and enhancement of the existing wetland habitat, as well as restoration and creation of additional bog turtle habitat.

The Friedburg Marsh Mitigation Site consists of existing wetlands (3.8 acres), upland buffer (38 acres), and wetland restoration/creation areas (5.7 acres). The restoration/creation areas were constructed in 1999/2000 to increase hydrology and improve bog turtle habitat. Construction activities involved filling ditches, constructing ditch plugs, grading to reflect groundwater profiles, removing invasive woody vegetation, and installing a new outlet for the upper pond area. No vegetation planting was conducted.

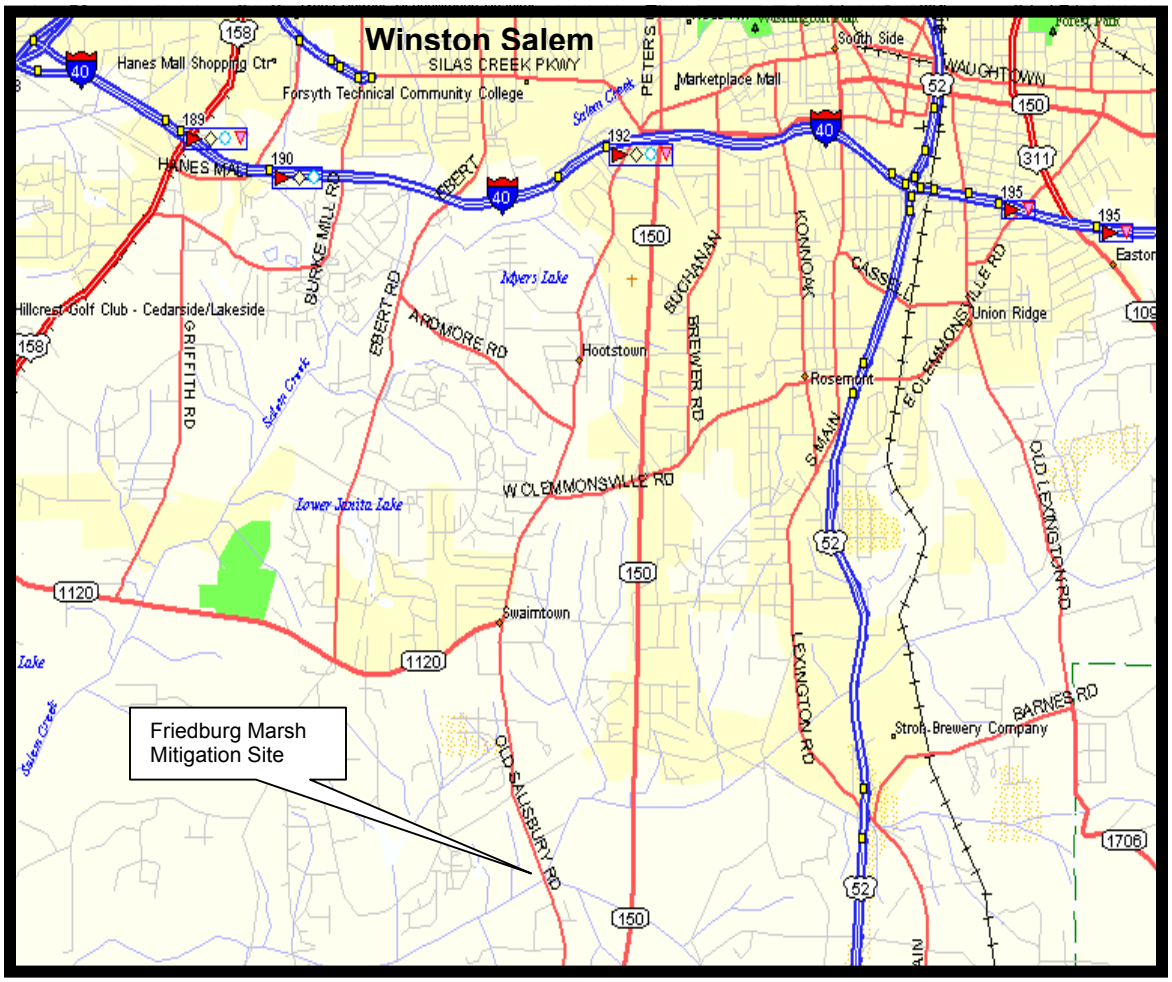
Friedburg Marsh is located in the Muddy Creek portion of the Yadkin River Basin. This site was created to offset wetland impacts associated with the Winston-Salem Outer Loop (TIP No. R-2247).

1.2 Purpose

In order to demonstrate successful mitigation, hydrologic criteria must be met during the five years of monitoring. The following report details the results of hydrologic monitoring during the 2003-year at the Friedburg Marsh Mitigation Site.

The 2003-year is the third monitoring year following site construction in 2000. Included in this report are analyses of hydrology and vegetation monitoring results, as well as local climate conditions throughout the growing season.

Figure 1. Friedburg Marsh Vicinity Map



1.3 Project History

May 1997	Feasibility Study Conducted
November 1997	Site Purchased by NCDOT, Initial Monitoring Wells Installed.
1999	Mitigation Plan Developed
Winter-Spring 2000	Grading and Construction
March 2000	Additional Monitoring Wells Installed
March-November 2001	Hydrology Monitoring (Year 1)
July 2001	Vegetation Monitoring (Year 1)
March-November 2002	Hydrology Monitoring (Year 2)
August 2002	Vegetation Monitoring (Year 2)
March-November 2003	Hydrology Monitoring (Year 3)
September 2003	Vegetation Monitoring (Year 3)

2.0 HYDROLOGY

2.1 Success Criteria

The success criteria for hydrology states that wetland hydrology will be established when water inundates or saturates (within 12 inches of the surface) consecutively for 5.0 percent of the growing season.

The growing season in Forsyth County begins March 28th and ends November 10th (228 days). These dates correspond to a 50 percent probability that temperatures will drop to 28ºF or lower after March 28 and before 10 November (Soil Survey of Forsyth County, 1976, p63). Five percent of the growing season translates to twelve consecutive days of inundation or saturation. Local climate must also represent average conditions for the area.

2.2 Hydrologic Description

RDS WL40 and WL20 units record all groundwater and surface water data (Figure 2). The groundwater gauges record groundwater data daily. The gauges are downloaded in the field on a monthly basis. In November 1997, six groundwater gauges were installed at Friedburg Marsh to monitor pre-construction hydrology and develop a mitigation plan. One gauge (S2C9913) was installed to record surface water and groundwater depths. Following construction six additional groundwater gauges were installed, of which one gauge (2139BB) was installed to record surface water and groundwater depths.

2.3 Results of Hydrologic Monitoring

2.3.1 Site Data

The maximum number of days that the groundwater was within twelve inches of the surface was determined for each gauge. This number was then converted into a percentage of the 228-day growing season (March 28 – November 10). The results are presented in Table 1 and Figure 3.

Appendix A contains a plot of the groundwater depth for each gauge. The maximum number of consecutive days and percentage of growing season of saturation/inundation is noted on each plot. The individual precipitation events, shown on the monitoring gauge graphs as bars, represent data provided by the NC State Climate Office.

Figure 3 provides a graphical representation of the hydrologic results. Gauges highlighted in blue indicate wetland hydrology for more than 12.5% of the growing season. Gauges highlighted in red show hydrology between 8% and 12.5% of the growing season, while those in green indicate hydrology between 5% and 8%. Gauges highlighted in black indicate no wetland hydrology (less than 5% of the growing season)

Figure 2. Friedburg Marsh Monitoring Gauge Location

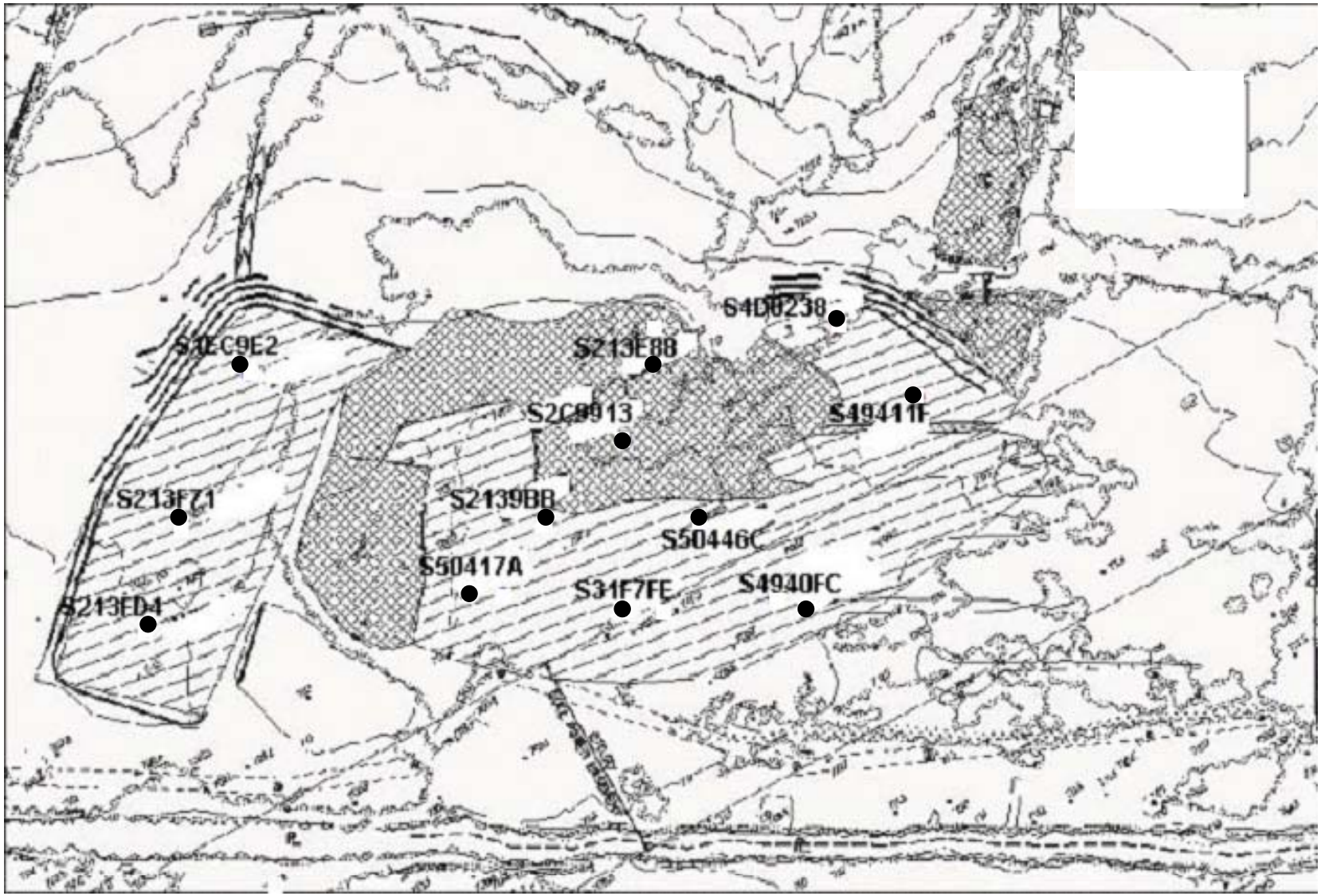


Table 1. 2003 Hydrologic Monitoring Results

Monitoring Gauge	<5%	5% - 8%	8% - 12.5%	>12.5%	Actual %	Success Dates
S2C9913				✕	98.2	April 1-Nov 10
S213FD4				✕	24.6	March 28-May 12 May 16-June 25 June 28-Aug 22
S51C0EB				✕	69.7	April 1-Sept 6
S1EC9E2				✕	45.2	March 28-July 8 August 22-Nov 10
S213E88				✕	100	March 28-Nov 10
S2139BB				✕	48.7	March 28-July 8 Aug 8-Nov 10
S50446C				✕	100	March 28-Nov 10
S4940FC	✕				0	Not Downloaded
S31F7FE				✕	100	March 28-Nov 10
S4D0238				✕	56.1	March 28-Aug 2
S49411F				✕	100	March 28-Nov 10
S50417A				✕	100	March 28-Nov 10

*The 2003 growing season experienced an above average rainfall year.

Specific Gauge Problems:

- Gauge **S4940FC** was not downloaded for the entire growing season because it could not be located.

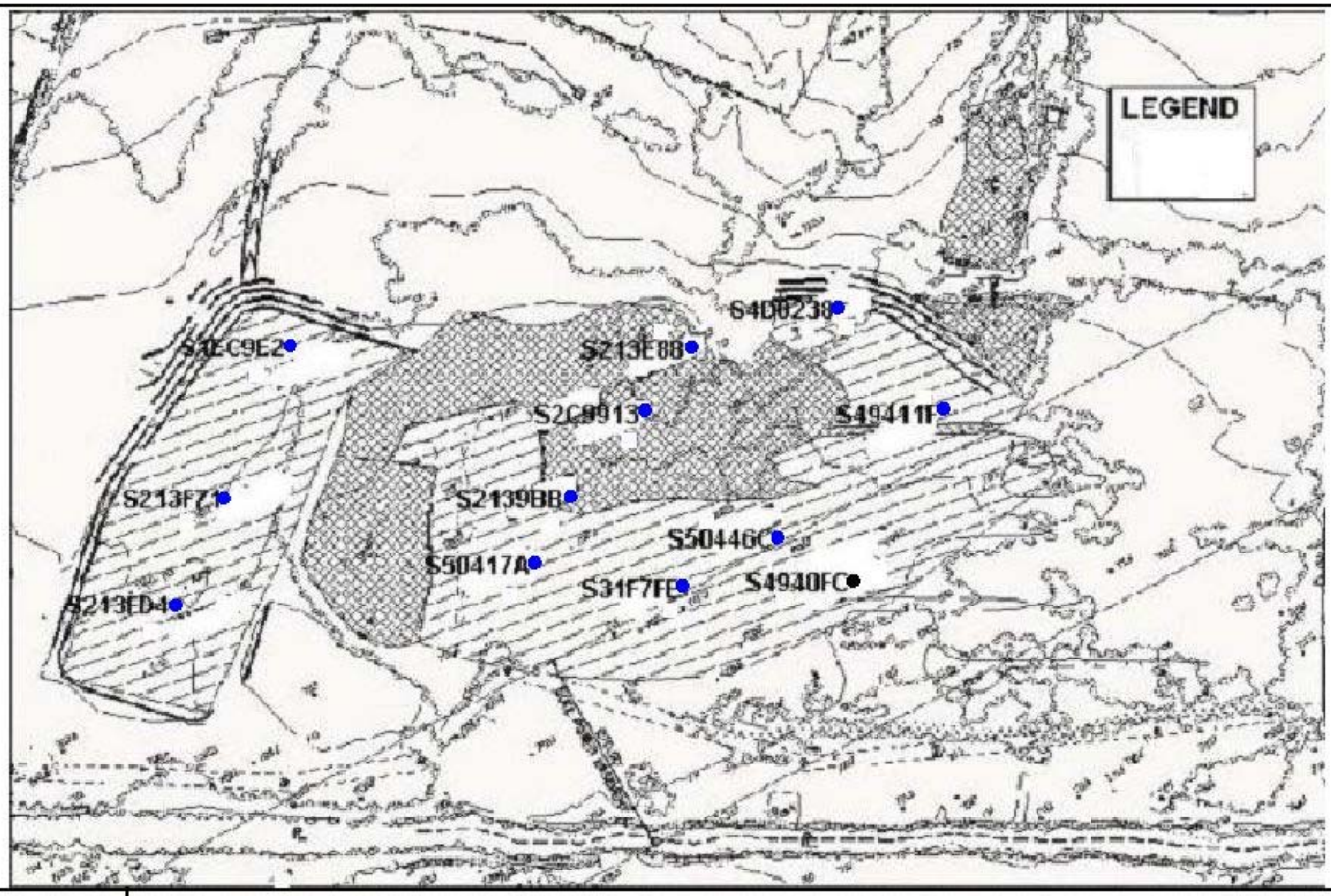


Figure 3. 2003 Hydrologic Monitoring Gauge Results

Hydrology Results

- < 5%
- 5 - 8%
- 8 - 12.5%
- > 12.5%

- Rain Gauge
- Surface Gauge

Not to Scale

2.3.2 Climatic Data

Figure 4 represents an evaluation of 2003 rainfall in comparison with historical rainfall data in order to determine whether 2003 was "average" in terms of precipitation. The historical rainfall data was collected from 1972 through 2003 (30 years). All rainfall data was provided by the NC State Climate Office, Yadkinville weather station.

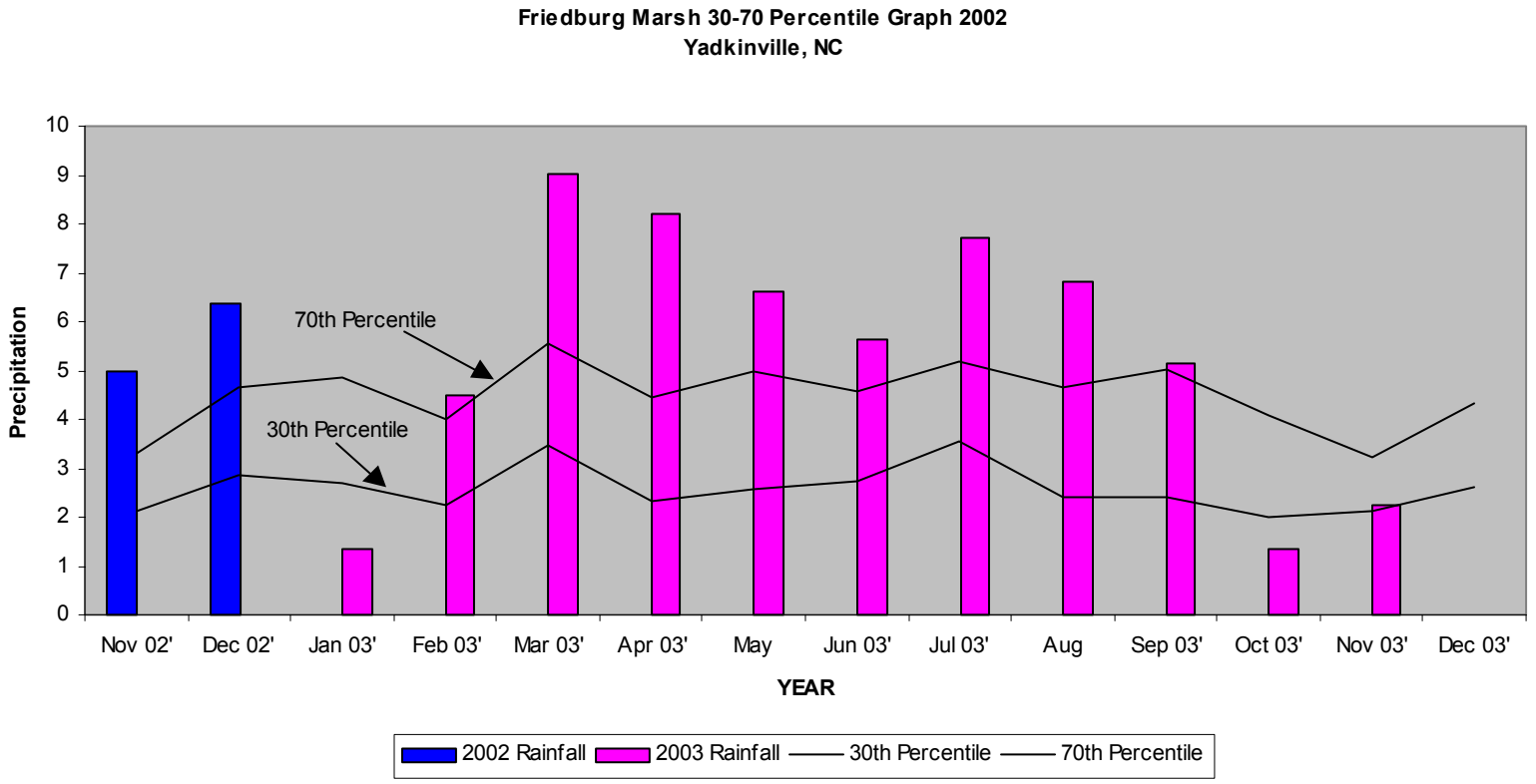
For the 2003-year, November (02'), December (02'), February, March, April, May, June, July, August, and September experienced above average rainfall. The months of January, October, and November recorded below average rainfall for the site. Overall, 2003 experienced an above average rainfall year.

2.4 Conclusions

For the 2003 monitoring year, the data indicates that all (12) of the groundwater gauges met the hydrologic success criteria of saturation within twelve inches of the surface for more than 5% of the growing season. Five of the gauges reported saturation/inundation for the entire growing season. Gauge (S4940FC) could not be located during the 2003-growing season; therefore no hydrologic data is available. NCDOT will locate this gauge before the beginning of the 2004-growing season or will be replace it if missing.

NCDOT will continue to monitor hydrology at the Friedburg Mitigation Site.

FIGURE 4. 30-70 Percentile Graph



3.0 VEGETATION: FRIEDBURG MARSH (YEAR 3 MONITORING)

3.1 Results of Vegetation Monitoring

No planting of trees or herbaceous species was undertaken as part of the Friedburg Marsh Site. As a result, no quantitative vegetation monitoring is required. General observations of common species have been made in conjunction with the hydrologic monitoring.

The following wet tolerant species were found in the creation/restoration area: Spike rush, pickerel weed, bulrush, *Juncus* sp., cattail, poplar, and green ash. Also found were: foxtail, broomsedge, beggar's ticks, barnyard grass, goldenrod, sweetgum, and multi-flora rose. The presence of these species in these areas has not affected the overall quality of the bog turtle habitat at Friedburg Marsh.

3.2 Conclusions

The vegetation in the restoration areas was dominated by wetland plant species and includes a variety of other species. A number of attempts were made this year to meet onsite with Mr. Dennis Herman of the Museum of Natural History. Due to scheduling conflicts, the meeting has not taken place. NCDOT's intention was to discuss the mowing of the site, with respect to potential impacts on the bog turtle habitat. NCDOT will schedule an onsite meeting with Mr. Herman in 2004.

NCDOT will continue visually monitoring vegetation at the Friedburg Marsh Mitigation Site.

4.0 OVERALL CONCLUSIONS/RECOMMENDATIONS

The 2003-year is the third consecutive year that hydrology and vegetation has been monitored.

For the 2003 monitoring year, the data indicates that all (12) of the groundwater gauges met the hydrologic success criteria of saturation within twelve inches of the surface for more than 5% of the growing season. Five of the gauges reported saturation/inundation for the entire growing season. Gauge (S4940FC) could not be located during the 2003-growing season; therefore no hydrologic data is available. NCDOT will locate this gauge before the beginning of the 2004-growing season or will be replace it if missing.

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APPENDIX A

GAUGE DATA GRAPHS

APPENDIX B

SITE PHOTOS

Friedburg

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

2003